

BASIS FOR THE AMENDMENT

Claims 1-41 have been canceled. Claims 42-57 have been added.

Claims 42 and are supported at page 6, line 22 to page 7, line 11 and at page 7, lines 17-20 of the specification.

Claim 43 is supported at page 7, lines 22-24 of the specification.

Claim 45 is supported by original claim 11 and at page 35, line 18 to page 36, line 2 of the specification.

Claim 46 is supported by original claim 10.

Claim 47 is supported at page 13, lines 11-15 of the specification.

Claim 48 is supported at page 9, line 22 to page 11, line 10 of the specification.

Claim 49 is supported by original claim 5.

Claim 50 is supported by original claim 3.

Claim 51 is supported by figure 1B and at page 24, lines 15-24 of the specification.

Claim 52 is supported by figure 1B and page 12, lines 9-19 of the specification.

Claim 53 is supported at page 12, lines 16-18 of the specification.

Claim 54 is supported by figure 1B.

Claim 55 is supported at page 73, lines 22-24 of the specification.

Claim 56 is supported at page 17, line 20 of the specification.

Claim 57 is supported at page 70, line 17 to page 71, line 2 of the specification.

No new matter is believed to have been added by entry of this amendment. Entry and favorable reconsideration are respectfully requested.

Upon entry of this amendment Claims 42-57 will now be active in this application.

REMARKS

Applicants respectfully request reconsideration of the application, as amended, in view of the following remarks.

The objection to the drawings is traversed. Applicants note that there is only one apparatus designated by the numeral “122” in the figures and shown in figure 4 in the right half. Reference number 122 in figure 4 designates an apparatus drawn as a column with a mechanically driven stirrer. Throughout the description, reference number 122 designates a raffinate wash column, except for page 36 line 18, where it designates a mechanical extraction column. However, there is no contradiction between these terms, since both terms clearly refer to the same apparatus in figure 4, the term “raffinate wash column” designating the function of the apparatus in the process and the term “mechanical extraction column” designating the mechanical operation of the apparatus. The examiner’s objection appears to be the result of confusing the reference characters “122” and “112”, since reference character 112 is used throughout the description to designate a destruct reactor.

Thus, the objection to the drawings should be withdrawn.

The rejection of Claims 1, 9 and 19 under 35 U.S.C. § 102(b) as anticipated by Park et al is respectfully traversed.

The present invention as set forth in new Claim 42 relates to a process for reducing the concentration of organosulfur compounds in a hydrocarbon-based fluid, comprising contacting said hydrocarbon-based fluid with a first oxidant in a first reactor to obtain a first reactor effluent and contacting a second liquid comprising at least one hydrocarbon with a second oxidant in a second reactor to obtain a second reactor effluent, wherein

- d) said second liquid comprises said first reactor effluent or is obtained from said first reactor effluent by phase separation as a first light phase,
- e) said first and second oxidant comprise a peroxy carboxylic acid obtained by reacting a carboxylic acid with hydrogen peroxide and
- f) said hydrocarbon fluid has a concentration of unoxidized organosulfur compounds that is greater than the concentration of unoxidized organosulfur compounds in said second liquid.

Park et al (US 5,004,830) do not disclose or suggest a process for reducing the concentration of organosulfur compounds in a hydrocarbon fluid and do not disclose or suggest an oxidant comprising a peroxy carboxylic acid.

Therefore, the rejection of Claims 1, 9 and 19 under 35 U.S.C. § 102(b) as anticipated by Park et al is believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of this rejection is respectfully requested.

The rejection of Claims 37 and 38 under 35 U.S.C. § 102(b) as anticipated by Gore et al is respectfully traversed.

Gore et al (US 2002/0035306) do not disclose or suggest a process with two oxidation stages, wherein the liquid reactor in the second oxidation stage comprises the effluent from the first oxidation stage or is obtained from such effluent by phase separation.

Therefore, the rejection of Claims 37 and 38 under 35 U.S.C. § 102(b) as anticipated by Gore et al is believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of this rejection is respectfully requested.

In addition, the rejection of Claims 1, 2, 4, 9-21 and 25 under 35 U.S.C. § 103(a) over Gore et al in view of Park et al is respectfully traversed.

At the outset, Applicants wish to note that US 6,596,914 and US 2002/0035306 are publications stemming from the same US patent application and therefore have identical disclosures.

It is an object of the present invention to remove organosulfur compounds to a very low level without loosing a substantial amount of the hydrocarbon in the process, see the specification at page 5, line 7 to page 6, line 12. New Claim 42 is drawn to reducing the concentration of organosulfur compounds in a hydrocarbon-based fluid.

Gore et al and Park et al are in different fields of endeavor and it is improper to combine them.

Park et al are not in the technical field of removing organosulfur compounds from hydrocarbon fuels, but in the entirely different technical field of making aromatic carboxylic acids from alkyl aromatic hydrocarbons. Park et al addresses how to improve the selectivity in the partial oxidation of the hydrocarbon and how to improve the yield of the hydrocarbon oxidation product, see column 1, lines 5 to 21. This problem is fundamentally different from the problem addressed in Gore et al and in the present invention, in that Park et al aims at completely converting the hydrocarbon to a carboxylic acid, whereas desulfurization of hydrocarbon fuels aims at recovering the unchanged hydrocarbon with only the organosulfur compounds removed. Since Park et al do not contain any teachings on how to oxidize organosulfur compounds and do not contain any teachings on how to carry out oxidation

reactions using a peroxy carboxylic acid, a person skilled in the art cannot find any guidance in Park et al on how to modify the process of Gore et al in order to improve the removal of organosulfur compounds and at the same time recover as much as possible of the hydrocarbon fuel with a reduced content of organosulfur compounds. A person skilled in the art would therefore have no motivation of combining any teachings of Park et al with the teachings of Gore et al.

The process of Gore is particularly aimed at removing organosulfur compounds from diesel fuel, which contains a substantial fraction of alkylaromatic hydrocarbon, see the application description page 28, table 1. The process of the process of Gore et al is selective in that organosulfur compounds are oxidized, whereas the hydrocarbons, including the alkylaromatic hydrocarbons remain un-oxidized. This is just the opposite selectivity compared to the process of Park et al, which aims at oxidizing the alkylaromatic hydrocarbon.

Since Gore et al teach a process with the steps of thiophene extraction, oxidation and sulfone extraction and does not suggest a two step oxidation and Park et al is in an entirely different technical field and addresses a fundamentally different technical problem, the process of claim 42 and the claims dependent thereon are not obvious over Gore et al in view of Park et al.

Further, Gore has the disadvantage of removing a large fraction of the hydrocarbons with the thiophene extract, from which they can not be recovered by distillation due to the similar boiling points of the extracted thiophenes and hydrocarbons. The process of the invention overcomes this disadvantage by increasing the efficiency of the oxidation by the

Application No.: 10/576,768
Reply to Office Action of: May 18, 2009

claimed two stage oxidation sequence, which allows to oxidize all organosulfur compounds, including the thiophene derivatives, to a high degree. This makes possible the recovery of hydrocarbons from the extract after recovery of the solvent by simple distillation, since the sulfoxides and sulfones formed in the oxidation have substantially higher boiling points than the hydrocarbons.

Therefore, the rejection of Claims 1, 2, 4, 9-21 and 25 under 35 U.S.C. § 103(a) over Gore et al in view of Park et al is believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of this rejection is respectfully requested.

In regard to the Examiner's request to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made, Applicants' Representative is confirming with the Applicants that all claims were and are commonly owned. Applicants' Representative will update the Examiner in the event that the claims are not commonly owned.

Application No.: 10/576,768
Reply to Office Action of: May 18, 2009

This application presents allowable subject matter, and the Examiner is kindly requested to pass it to issue. Should the Examiner have any questions regarding the claims or otherwise wish to discuss this case, he is kindly invited to contact Applicants' below-signed representative, who would be happy to provide any assistance deemed necessary in speeding this application to allowance.

Respectfully submitted,

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